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**Christina L. Perino**  
Manager  
Licensing

GNRO-2010/00036

May 5, 2010

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Subject: LER 2010-001-00 Automatic Reactor Scram On Decreasing Coolant Level Due  
To Inadvertent Reactor Feed Pump Trip  
Grand Gulf Nuclear Station, Unit 1  
Docket No. 50-416  
License No. NPF-29

Dear Sir or Madam:

Attached is Licensee Event Report (LER) 2010-001-00 which is a final report. This report is submitted in accordance with 10 CFR 73(a)(2)(iv)(A).

This letter does not contain any commitments. If you have any questions regarding the attached report, please call Peggy R. Rescheske at 601-437-1781.

Sincerely,

A handwritten signature in cursive script, appearing to read "Christina L. Perino".

CLP/PRR

Attachment: LER 2010-001-00

cc: (See Next Page)



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cc: NRC Senior Resident Inspector  
Grand Gulf Nuclear Station  
Port Gibson, MS 39150

U. S. Nuclear Regulatory Commission  
ATTN: Mr. Elmo E. Collins (w/2)  
Regional Administrator, Region IV  
612 East Lamar Blvd, Suite 400  
Arlington, TX 76011-4125

U.S. Nuclear Regulatory Commission  
ATTN: Mr. Carl F. Lyon, NRR/ADRO/DORL (w/2)  
Mail Stop OWFN/8 B1  
11555 Rockville Pike  
Rockville, MD 20852-2378

## LICENSEE EVENT REPORT (LER)

Estimated burden per response to comply with this mandatory collection request: 50 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to [infocollect@nrc.gov](mailto:infocollect@nrc.gov), and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202, (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

<b>1. FACILITY NAME</b> Grand Gulf Nuclear Station, Unit 1	<b>2. DOCKET NUMBER</b> 05000416	<b>3. PAGE</b> 1 of 4
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<b>4. TITLE</b> Automatic Reactor Scram On Decreasing Reactor Water Level Due To Inadvertent Reactor Feed Pump Trip
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5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
03	08	2010	2010	- 001 -	00	05	05	2010	N/A	N/A
									FACILITY NAME	DOCKET NUMBER
									N/A	N/A

<b>9. OPERATING MODE</b>  1	<b>11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)</b>									
	<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 20.2203(a)(4) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(iii) <input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> OTHER Specify in Abstract below or in NRC Form 366A						
<b>10. POWER LEVEL</b>  100										

## 12. LICENSEE CONTACT FOR THIS LER

<b>FACILITY NAME</b> Christina L. Perino, Licensing Manager	<b>TELEPHONE NUMBER (Include Area Code)</b> 601-437-6299
----------------------------------------------------------------	-------------------------------------------------------------

## 13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
D	SJ	FIT	RSMT	Y	D	SJ	SCV	BYJK	Y

## 14. SUPPLEMENTAL REPORT EXPECTED

☐ YES (If yes, complete 15. EXPECTED SUBMISSION DATE) ☒ NO

## 15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On March 8, 2010, at approximately 1635 hours Central Standard Time (CST), Grand Gulf Nuclear Station (GGNS) was in Mode 1 operating at approximately 100 percent power, when an actuation of the Reactor Protection System (RPS) occurred due to decreasing reactor water level. The cause of the event was the combination of the Reactor Feed Pump B (RFP B) minimum flow valve failing open due to an erroneous signal from flow instrumentation, and the Reactor Feed Pump Turbine A (RFPT A) tripping due to speed demand mismatch caused by control valve linkage binding. One feed pump could not support the reactor feedwater demand, resulting in a reactor scram per design on Reactor Water Level 3 (+11.4 inches narrow range). The appropriate off-normal event procedures were entered to mitigate the transient with all systems responding as designed. All control rods inserted to shut down the reactor. No loss of offsite or Engineered Safety Feature (ESF) power occurred. No emergency core cooling system (ECCS) initiation setpoint was reached and no safety relief valves (SRVs) lifted. The normal heat sink (main condenser) remained available during this event. Reactor water level was restored and maintained by the condensate and feedwater system.

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**A. REPORTABLE OCCURRENCE**

On March 8, 2010, at approximately 1635 hours Central Standard Time (CST), Grand Gulf Nuclear Station (GGNS) experienced an automatic reactor scram due to decreasing reactor water level. Upon decreasing to Reactor Water Level 3 (+11.4 inches narrow range), a Reactor Protection System (RPS) [JC] scram signal was automatically initiated. Actuation of the RPS resulting in an automatic reactor scram is reportable pursuant to 10 CFR 50.73(a)(2)(iv)(A). Telephone notification was made on March 8, 2010, to the NRC Emergency Notification System (ENS) within 4 hours of the event pursuant to 10 CFR 72(b)(2)(iv)(B).

**B. INITIAL CONDITIONS**

At the time of the event, the reactor was in OPERATIONAL MODE 1 with reactor power at approximately 100 percent. There were no additional inoperable structures, systems, or components at the start of the event that contributed to this event.

**C. DESCRIPTION OF OCCURRENCE**

On March 8, 2010, at 1635 hours CST, an automatic reactor scram occurred on Low Reactor Pressure Vessel (RPV) level (Level 3, +11.4 inches narrow range). Prior to the scram, increasing speed and flow on the Reactor Feed Pump Turbine A (RFPT A) [SJ] was noted, followed by RFPT A Governor Valve Trouble alarm and subsequent trip of the RFPT A. As the expected Reactor Recirculation System [AD] Flow Control Valve (FCV) runback was being observed, the Recirculation Hydraulic Power Unit A (HPU A) tripped, stopping the FCV runback.

The RFP B minimum flow valve 1N21F503B failed open due to transmitter 1N21N088B, Reactor Feed Pump B (RFP B) suction flow, generating an erroneous control signal, driving the RFP B minimum flow valve open. The erroneous signal was due to an electrical short in the control circuit caused by condensation from a steam leak. As both feed pumps attempted to increase speed, the RFPT A control valve linkage experienced binding and the RFPT A tripped due to speed demand mismatch. When the RFPT A tripped with the higher demand caused by the opening of the 1N21F503B, the total demand exceeded the capacity of the RFP B and the reactor automatically scrammed on low reactor water level. Investigation revealed that the plant response would have been the same (i.e., reactor scram) had the Recirculation FCV A tripped or it had successfully runback. The investigation also determined that if the RFP B minimum flow valve had failed open without a RFPT A trip, the reactor would not have scrammed.

The automatic reactor scram occurred as designed on low RPV level (Level 3, +11.4 inches narrow range) due to loss of feedwater flow. Level 3 is also a setpoint for Group 2 (Residual Heat Removal (RHR) to Radwaste) and Group 3 (Shutdown Cooling Isolation). No valves isolated in these systems due to their being in their normally closed position. The appropriate off-normal event procedures were implemented to mitigate the transient with all systems responding as designed after the scram. The lowest reactor water level observed was approximately -31 inches Wide Range. All withdrawn control rods inserted to the full in position; sixteen (16) control rods did not indicate a position of 00, but did have their green "full-in" indication. Subsequent investigation determined these sixteen rods fully inserted past position "00" but did not settle back to position "00." No loss of offsite or Engineered Safety Feature (ESF) power occurred. No emergency core cooling system (ECCS) initiation setpoint was reached and no safety relief valves (SRVs) lifted.

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All safety related equipment operated as expected. The normal heat sink (main condenser) remained available during this event. Reactor water level was restored and maintained by the condensate and feedwater system.

**D. APPARENT CAUSE**

The cause of the event was the combination of the RFP B minimum flow valve failing open due to an erroneous signal from flow instrumentation, and the RFPT A tripping due to speed demand mismatch caused by control valve linkage binding. One feed pump could not support the reactor feedwater demand and the reactor scrambled on low level.

The erroneous signal from the flow instrumentation was a result of an electrical short in the control circuit. An inadequate splice assembly allowed water to penetrate the cable jacket at the spliced connection causing a short, which affected the signal for the flow transmitter driving the minimum flow valve open. The junction box where the splice was located was discovered to be full of water due to condensation from a steam leak on valve packing in the feedwater heater room. RFP A tripped when the demand signal exceeded the actual flow. The speed demand mismatch was created due to binding in the control valve linkage for the RFPT A, which prevented the valve from opening to match the demand. The binding was due to a lack of lubrication and a build up of wear material between the gears.

The root cause of the event was determined to be a lack of adequate work instructions for: (1) installing outer jacket sealing on cable splices, and (2) inspection and lubrication of rack and pinion gears. Contributing causes included the magnitude of the steam leak, the water accumulation in junction boxes in the turbine building (e.g., no weep holes in bottom of box), and not effectively implementing measures to mitigate the potential effects of a steam leak.

**E. CORRECTIVE ACTIONS**

Immediate Corrective Actions - Reactor water level was restored and the plant was placed in a stable condition. Condition Report CR-GGN-2010-01503 was written to document and investigate the event and a Root Cause Evaluation was initiated.

Long Term Corrective Actions - The Root Cause Evaluation will address additional corrective actions.

**F. SAFETY ASSESSMENT**

Immediate actions performed by the Operations staff were adequate and appropriate in placing and maintaining the reactor in a safe shutdown condition. The lowest reactor level indicated was -31 inches Wide Range. This is above the initiation setpoint for ECCS systems. Reactor vessel water level was restored and maintained by the condensate and feedwater system. The Group 2 Residual Heat Removal (RHR) to Radwaste and Group 3 RHR Shutdown Cooling automatic isolations were received; however, no valves isolated because they were in their normally closed position prior to the event. No Safety Relief Valves lifted as a result of this event and all other systems performed as required. This event did not prevent the fulfillment of a safety function, and therefore there were no safety system functional failures. Based on the discussion provided above, the health and safety of the public was not compromised by this event.

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**G. ADDITIONAL INFORMATION**

Previous Similar Events - Pursuant to 10CFR50.73(b)(5) this issue is considered an infrequent event. There has not been any occurrence of the same underlying concern in the past two years at Grand Gulf Nuclear Station. Although GGNS has experienced RFPT transients and/or scrams in the past, this event was caused by a unique combination of circumstances involving both trains (i.e., steam leaks inducing electrical faults on train B along with control valve linkage binding on train A).